HONOLULU

LA JOLLA

TIBURON

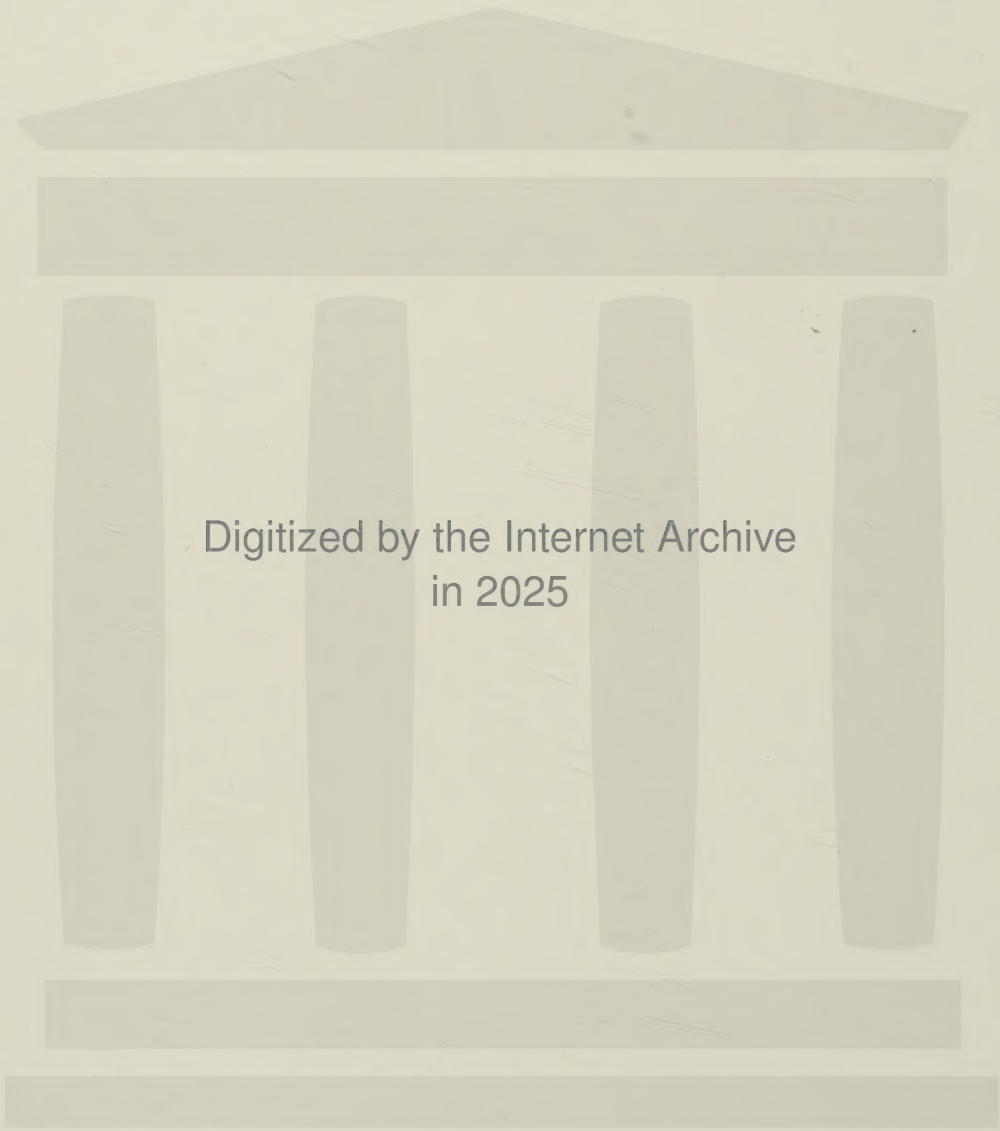
SOUTHWEST FISHERIES CENTER

MONTHLY REPORT - JULY 1976

RESEARCH HIGHLIGHTS

	Page
Publications	1
NMFS Observers Attend Fisheries Negotiations Meeting in Mexico City	4
Unusual Recovery of Drift Bottle Reported	5
Pacific Trojan Arrives with 1,300 Scoops of Northern Anchovy from California	7
Cruise Made Aboard Jordan to Measure Physiological and Biochemical Responses in Albacore	8
Long Range Prediction of Spawning Biomass of Some Fish Populations Can Be Inferred from Scale Deposition Rates	15
CalCOFI Hosts Otolith Workshop at Center	17
Study Underway on Fishing Effort Estimator for Tuna Purse Seining	19
Extensive Warming of Sea Surface Temperatures Noted in Eastern Tropical Pacific	20
Study Relating Submarine Light to Visual Pigments and Activity of Kelp Forest Fishes Nears Completion	24
Samples of Euphausia Bringing Good Reactions from Buyers and Dealers	26
Inoculation of Silver Salmon Completed	26

NOAA/NMFS



Digitized by the Internet Archive
in 2025

https://archive.org/details/administrative-report-lj_1976-07

SOUTHWEST FISHERIES CENTER
LA JOLLA, CALIFORNIA

HONOLULU LABORATORY
LA JOLLA LABORATORY
TIBURON LABORATORY

MONTHLY REPORT - JULY 1976

STATUS OF PUBLICATIONS

Published

Laurs, R. Michael, Harold B. Clemens, and Larry H. Hreha. 1976. Nominal catch-per-unit effort of albacore, Thunnus alalunga (Bonnaterre), caught by U.S. jig vessels during 1961-70. Mar. Fish. Rev. 38(5): 1-32.

ABSTRACT-Catch-per-unit effort data by time-area strata for the albacore, Thunnus alalunga (Bonnaterre), fishery off the west coast of North America are presented for the years 1961-70. Results indicate that while the fishery may range from central Baja California, Mexico to British Columbia, Canada, it is usually not continuous over this range, but rather is centered in more restricted regions in a given fishing season. Marked annual latitudinal variations in the fishery mainly located in "southern" waters from central Baja California to San Francisco during 1961-65 and in "northern" waters off the Pacific Northwest during 1966-70. Very little variation among years in the offshore distribution of the fishery was indicated, and for the most part it was restricted to within 200-250 miles of the shore with highest catch rates frequently made within 100 miles of the coast. During "southern" fishery years, catch rates indicative of commercial concentrations of albacore were generally made 2-4 weeks earlier, during mid-June to early July, than during "northern" fishery years. Differences in the pattern of the seasonal distribution of the fishery were also apparent between "southern" and "northern" fishery years.

A twofold variation was observed in the estimates of annual catch-per-unit effort over the 10-year period; however, relatively high catch rates with little variation were observed during the later years, 1967-70. During all of the years the concentration index was greater than 1.0, indicating that fishers tended to concentrate their effort in areas or periods where or when the average catch-per-unit effort was high.

This report does not constitute publication and is for information only.

These data were collected by individual States and then merged and standardized. The results are unique in that they make available, for the first time, estimates of standardized catch-per-unit effort for the entire range of the fishery. This has been made possible by the cooperation of scientists from the National Oceanic and Atmospheric Administration, National Marine Fisheries Service; State of California Resources Agency, Department of Fish and Game; and Fish Commission of Oregon.

Hewitt, Roger P., Paul E. Smith, and John C. Brown. 1976. Development and use of sonar mapping for pelagic stock assessment in the California Current area. Fish. Bull., U.S. 74(2): 281-300.

A method for pelagic fish stock assessment is presented which utilizes a fixed sonar beam for mapping fish schools. Samples of the two major acoustic properties of fish schools are presented, i.e., acoustically derived horizontal dimensions (representative of school volume) and target strengths (which may be representative of school compaction). Sampling biases and sources of sampling variability in the measurement of these properties are discussed. The results of two experiments, conducted to determine the weight of a fish school as a function of its acoustic characteristics, are presented. In the first experiment, an acoustically transparent trap was used to recreate an aggregation of fish and in the second, commercial fishing boats were chartered to capture whole schools. An automated sonar data acquisition and processing system is described and test results presented. The results of paired automated surveys of the Los Angeles (southern California) Bight are presented and discussed. The paper reports development of the sonar-fish school mapping method first documented by P.E. Smith in 1970.

Field investigations, conducted in cooperation with the Navy and the California Department of Fish and Game, indicate a median school size of 30 m diameter, a mean fish density of 15 kg of fish biomass per square meter of horizontal school area, and a biomass estimate of 1.23 to 2.30 x 10^6 metric tons for pelagic schooled targets in the Los Angeles Bight.

Perrin, William F. 1976. First record of the melon-headed whale, Peponocephala electra, in the eastern Pacific, with a summary of world distribution. Fish. Bull., U.S. (Note) 74(2): 457-458.

Perrin, William F., James M. Coe, and James R. Zweifel. 1976. Growth and reproduction of the spotted porpoise, Stenella attenuata, in the offshore eastern tropical Pacific. Fish. Bull., U.S. 74(2): 229-269.

This study is based on data from several thousand specimens of spotted-porpoise, Stenella attenuata, incidentally killed in the purse seine fishery for yellowfin tuna, Thunnus albacares. Average length at birth is 82.5 cm. Gestation is 11.5 mo. Average length at 1 year is 138 cm. Length-weight equations are given for fetuses and postnatal males and females. Age was estimated from dentinal layers in thin

sections of teeth. A two-phase Laird-Gompertz growth model was fitted to the layer-length data. Direct calibration of the dentinal layers beyond the first year (two layers) was not possible, and three alternative hypotheses were considered: 1) two layers per year, until pulp cavity occluded, 2) two layers per year in first year, and one per year thereafter, and 3) two layers per year until puberty, and one per year thereafter. The second alternative is most probably the correct one, but reproductive parameters were estimated in terms of layers. Breeding is diffusely seasonal, with prolonged calving seasons in spring and fall and a pronounced low in winter. A third calving season may exist in the summer. Average age at attainment of sexual maturity of males is approximately 12 layers (average length about 195 cm and average weight about 75 kg). Females attain sexual maturity on the average at about 9 layers and 181 cm. Ovarian changes in adult females are described. Apparently postreproductive females were encountered in the samples. It is concluded that corpora albicantia of ovulation and pregnancy persist indefinitely in the ovaries. It was not possible to distinguish between the two types of corpora. Ovulation rates changes with age, from about four per layer in very young adult females, to about one per layer in older females. The average calving interval is 26 mo long and consist of 11.5 mo of pregnancy, 11.2 mo of lactation, and 3.3 mo of resting and/or estrus. About 9.6% of lactating females are also pregnant. Pregnancy rate decreases with age, from about 0.6 per year at 8 to 10 layers, to about 0.3 at 16 layers. The overall sample contained 44.9% males and 55.1% females. Sex ratio changes with age, from near parity at birth, indicating higher mortality rate for males. Gross annual production of calves, based on age and sex structures of the sample and the estimated pregnancy rate, is 14.4% of the population per year. No evidence was found of age or sex segregation in schooling. The estimated parameters differ in a consistent way from those estimated for a population of Stenella attenuata in the western Pacific, possibly reflecting the exploitation in the eastern Pacific.

Sakagawa, Gary T. and Makoto Kimura. 1976. Growth of laboratory-reared northern anchovy, Engraulis mordax, from southern California. Fish. Bull., U.S. 74(2): 271-279.

The northern anchovy, Engraulis mordax, was experimentally reared in the laboratory at the Southwest Fisheries Center, La Jolla, California. Data from three experiments were used to empirically fit a two-phase Gompertz growth model. The model describes growth from hatching to about 20 mo of age. It was estimated that the average length of laboratory-reared anchovies is 102 mm at 1 year old and 119 mm at 2 years old. Growth of laboratory-reared anchovies was comparable to that of anchovies in the wild.

Translation

Tanaka, Tamotsu. n.d. Atlas of skipjack tuna fishing grounds in southern waters, 1975 fishing season (June 1975-May 1976) (Nanpō kaiiki ni okeru katsuo gyojyōzu, Showa 50 nendo). Tohoku Regional Fisheries Research Laboratory 5 p. text, 15 charts. (Translated from the Japanese by Tamio Otsu, 1976, 25 p., Translation No. 15.)

EXTENDED JURISDICTION

Ad Hoc Extended Jurisdiction Management Plan Team Set Up

This month at the La Jolla Laboratory an ad hoc Extended Jurisdiction Management Plan team consisting of Drs. D. Huppert and G. Stauffer was set up. The first draft of a proposed Task Development Plan (TDP) was completed which is designed to meet the responsibilities related to the review and/or creation of fishery management plans, definition, and assessment of optimal fishery yields and monitoring of the marine fish stocks.

Drs. Huppert and Stauffer also reviewed first drafts of fishery management plans for the Pacific mackerel and jack mackerel, prepared by the California Department of Fish and Game. Dr. John Gates, Professor of Resource Economics, University of Rhode Island, was in La Jolla on July 13 to confer with the team of the availability of economic data on the Pacific coast fisheries for the Pacific Coast Regional Council, working for the Office of Technology Assessment, Oceans Assessment Programs, Congress of the United States.

* * * * * * * * * *

The question of which species of tuna might be considered as a highly-migratory species received attention. Based on taxomony, existing FDA regulations, Law of the Sea list of highly-migratory species, joint FAO/WHO Food Standard Program Codex Alimentarius Commission list of tuna species, and customary usage, a list of recommended highly-migratory tuna species was prepared by Dr. Huppert. This list will be distributed for internal review and comment.

NMFS Observers Attend Fisheries Negotiations Meeting in Mexico City

SWFC Planning Officer David Mackett and Wil Van Campen, NMFS Coordinator for the Pacific Tuna Development Foundation, attended the fisheries negotiations meetings in Mexico City, July 19-22. Mr. Van Campen later supplied the following summary of the meeting. "U.S. and Mexican delegations, accompanied by numerous industry advisers, took part in the second round of negotiations on the conditions under which various U.S. fisheries will be permitted to continue in the 200-mile economic zone which Mexico will implement August 1."

Mr. Van Campen said further that an earlier session in May had brought agreement only on the terms for sportfishing by American and other foreigners in Mexican waters. This round brought the parties close to agreement on other outstanding issues, of which the most important are shrimp fishing and snapper fishing in the Gulf and the Caribbean. An acceptable compromise was reached concerning the treatment of fishing for highly-migratory species within the Mexican zone. The principal remaining area of disagreement is that of fishing within 12 miles of the Pacific Coast, where the biggest problem is the number of U.S. boats which will continue to have the privilege. This question and a number of details of other issues will be taken up in a third negotiating session scheduled to begin August 5 in New York, where the principals will be attending the UN Law of the Sea Conference. There are good prospects that the third session will result in a comprehensive agreement that can be quickly signed by both parties.

Preparation of Preliminary Management Plans for Key Fishery Management Units Under Extended Jurisdiction Continues

Dr. Jerry Wetherall, Fishery Biologist at the Honolulu Laboratory, who is coordinating the preparation of the management plans, presided over meetings to discuss the billfish and precious coral management units with representatives of the Hawaii Division of Fish and Game and other key constituents representing both commercial and recreational fishing interests in Hawaii. Other Honolulu Laboratory staff members participating in the deliberations were Mr. Shomura, Dr. Robert Skillman, and Messrs. Richard Uchida, Thomas Hida, and Heeny Yuen.

In connection with the management plans Mr. Hida completed the preparation of background material for the precious coral management unit for Dr. Wetherall. Mr. Uchida, who is gathering material for the billfish management unit, interviewed Captain Gengo Nabeshima, master of the Hawaiian longline vessel, Betty N, about recent activities among the Hawaiian longline fleet including areas of operation, catch and disposition of billfishes, and activities of foreign fishing vessels near the Hawaiian Islands.

HONOLULU LABORATORY

FISH ENVIRONMENT INVESTIGATIONS

Unusual Recovery of Drift Bottle Reported

Dr. Richard Barkley, Chief, Fish Environment Investigations, reported on the somewhat bizarre recovery of a drift bottle. One of the Honolulu Laboratory's earliest drift bottles, serial number 639, was reported found recently on the south coast of Molokai, 60 miles northeast of the place where it was released, 15 years, 53 days earlier. This is clearly a record for elapsed time, and a near-record for the shortest distance traveled, making this by far the slowest moving bottle in our records. Dr. Barkley speculated

that the bottle probably floated ashore shortly after being released in 1961. The person who found the drift bottle, a visitor from Illinois, has been asked for more details on the recovery of the bottle.

Effect of Feeding Frenzy on Excess Body Temperature of Kawakawa Examined

Dr. Andrew Dizon, Leader of the Experimental Ecology of Tunas group, continued experiments to determine the time and magnitude of the increase in body temperature due to feeding frenzy. Although initial experiments were qui successful and showed the kawakawa increased their body temperature more than 8° C above ambient, work done with subsequent fish has not been successful. Difficulties have been experienced with the ultrasonic transmitters which had tendency of working loose from the fish and by the fish's refusal to feed.

First Tests Conducted on Empirical Heat-Flow Model

Sonic tags were also used to determine the effect of activity and ambient temperature on skipjack tuna body temperature and to compare actual body temperature with modeled body temperatures. The fish were kept in the behavioral thermoregulation tank for 8 hours at each of three temperatures (20°, 25°, and 30° C). Results indicate that excess temperature remains constant at about 3° above ambient at all three temperatures. Average swim speeds seemed somewhat higher at 30° than at 20° C. Dr. Dizon noted that data from his empirical models, which predicts body temperature, given a time series of swim speeds and ambient temperatures, fits observed red muscle temperatures. A parameter that estimates red muscle weight-specific respiration with whole body weight-specific respiration had to be adjusted by factors ranging from a 2.5X multiplier for the largest skipjack tuna tested to a 5X multiplier for th smallest kawakawa in the experiments.

Although tag shedding has not been a problem in these experiments as it h been in the feeding experiments, mortality occurring within several hours afte tagging has been serious. Supersaturating the tank with oxygen and tagging th fish after it has acclimated to the tank for several hours appears helpful in reducing mortality.

Stasis Metabolic Rate of Skipjack Tuna Experiments Continue

Work continued this month to determine the effect of body size on weight-specific stasis metabolic rate (the metabolic rate at zero overt muscular activity).

The technique has evolved somewhat from that reported last month; survival in the apparatus was improved when a small amount of gallamine triethiodide (0.1 ml/kg) was injected into the fish to tranquilize it before transfe into the respirometer.

Our results after 12 fish (0.733 to 2.18 kg) indicate a very large effect of weight on weight-specific stasis respiration rate; $\log r$ (mg O_2 g^{-1} h^{-1}) = 1.75 - 0.75 log w (grams), $r = 0.69$*.

TUNA ASSESSMENT AND DEVELOPMENT INVESTIGATIONS

Pacific Trojan Arrives With 1,300 Scoops of Northern Anchovy from California

On July 19, the West Coast baitboat Pacific Trojan arrived at Kewalo Basin with a load of approximately 1,300 scoops of northern anchovy. The Pacific Trojan, was under contract to the Pacific Tuna Development Foundation to deliver the bait which was to be used in sea trials for skipjack tuna fishing by the Hawaiian pole-and-line fishing vessels. The northern anchovy were distributed to nine vessels based on Oahu for sea trials. As planned, observers boarded several of the vessels to record data on the effectiveness and acceptability of northern anchovy as skipjack tuna bait. The observers included Laboratory Director Richard Shomura on the Lehua, Mr. Richard Uchida on the Neptune, Mr. Thomas Hida on the Kula Kai, Mr. Paul Shiota on the Buccaneer, and Mr. James Uchiyama on the Sea Queen. A preliminary report on the results of the sea trials is being prepared by Mr. Uchida, who was coordinator of the sea trial experiments.

* * * * * * * * * *

Mr. Otsu, Chief, Tuna Assessment and Development Investigations, completed a translation of "Atlas of skipjack tuna fishery grounds in southern waters, 1975 fishing season (June 1975-May 1976)," which is the latest in a series of atlases which describes the fishery situation in the Japanese skipjack tuna fishery. Mr. Otsu also was Acting Director for the first 2 weeks of July during the absence of Mr. Shomura who was on annual leave.

* * * * * * * * * *

Also during the month Fishery Biologist Hida made arrangements for the painting of the roll-on/roll-off bait tanks and had discussions with staff members on plans for the construction of holding pens for the northern anchovy that are to be transported to Honolulu in the roll-on/roll-off bait tanks.

* * * * * * * * * *

Mr. Uchida, together with Mr. Otsu attended a meeting of the Tuna Group to discuss research proposals on the relation of histamine and honeycombing in skipjack tuna, submitted by Dr. Tommy Nakagawa of the Department of Food Science and Technology, University of Hawaii. Mr. Uchida also collaborated with Mrs. Lucille Tsukano and Sally Kuba in preparing a response to a questionnaire on the feasibility of establishing a marine information center in Hawaii. The questionnaire is part of a study being conducted by Belt, Collins and Associates, Ltd. (an engineering firm) for the Hawaii State Department of Planning and Economic Development.

Hawaiian Skipjack Tuna Catches Fall Below Long-Term Average

The June 28 to July 25 catch of skipjack tuna in the Hawaiian fishery reached an estimated 348.2 metric tons (MT), 275.2 MT above the catch for the same period in 1975 but 428.6 MT below the average for the same period in 1948-75. The catch from January through July 25 was estimated at 2,203.5 MT, which is 710.4 MT above last year's catch for the same period but 392.8 MT below the long-term average.

* * * * * * * * * *

LA JOLLA LABORATORY

Coastal Fisheries Resources Division

ALBACORE FISHERIES PROGRAM

Cruise Made Aboard Jordan to Measure Physiological and Biochemical Responses in Albacore

Dr. Michael Laurs, Leader of the Albacore Fisheries Investigations, reported that a successful cruise was conducted July 26-30 aboard the David Starr Jordan, NOAA research vessel, to measure physiological and biochemical responses in albacore and to evaluate a life-support system for transporting and holding live albacore. These studies are directed toward gaining knowledge concerning the functional adaptations of albacore to their ocean environment and understanding albacore-ocean relationships. The objectives of the cruise were to 1) conduct studies to refine a life-support system for transporting live albacore including administration of anesthetics, method of restraining fish and control of dissolved oxygen and water temperatures in the system, 2) evaluate the use of various drugs and dosages for anesthetizing and holding live albacore, 3) measure cardiac function in anesthetized albacore, 4) measure blood volume, 5) determine the distribution of blood in body compartments, 6) measure gas exchange and pH in anterial blood, 7) define and characterize the major cellular and humoral components of albacore blood including the relative proportions and types of circulating peripheral blood cells, hematocrit, hemoglobin content of red blood cells, etc., 8) conduct a preliminary characterization of the three principle plasma protein mediation pathways, namely the complement, coagulation and fibrinolytic systems, 9) measure selected enzymes associated with skeletal and organ muscle stress, and lactic acid in the serum of albacore under various degrees of stress, and 10) measure energy consumption of albacore at zero activity.

Dr. Laurs, planned and coordinated research operations and was Chief Scientist on the cruise. Drs. Thomas Kravis, David Morrison, Stephen Russell and Richard Ulevitch, and Ms. Ann Fozier McIntosh of Scripps Medical Clinic and Research Foundation and Richard Brill of the University of Hawaii conducte research studies during the cruise. Frank White of the UCSD School of Medicin

is collaborating on studies of the distribution of blood with body compartments and estimation of gill surface area. The latter studies will be performed on an albacore which was transported ashore alive and injected with radionucleide-labeled microspheres. All objectives of the cruise were met, except number (3) which was not accomplished due to equipment malfunctions.

Analyses of the data collected on the cruise are still underway; however, some preliminary findings are available. On earlier cruises, Dr. Laurs demonstrated that it is feasible to hold and transport albacore alive under anesthesia in a life-support system. Results from this cruise show that survival of fish can be increased appreciably by incorporating in the life support system a filtering set-up to remove particulate materials that otherwise can lodge on the gill surfaces of the fish, and a means of maintaining the water in the life-support system at a pH of about 7.5.

Satisfactory results were achieved in anesthetizing fish by first flushing a 125 mg/liter concentration of aqueous tricaine methanesulfonate (MS222) over the gills until narcosis. The fish was then placed in the life-support system where it was maintained under light sedation with a combination of low dosage MS222 (about 10 to 15 mg/liter) and intravascular injections (0.1 to 0.3 cc) Flaxedil (gallamine triethiodide), or with intravascular or intramuscular injections of Flaxedil alone. Mixed results were obtained on fish which after initial narcosis were placed in the life support system and administered other drugs - two fish using aqueous MS222 flushed over the gills and injections of Valium, and one fish using MS222 and intraperitonaeal injection of succinol choline. Poor results were obtained on fish which were held in the life-support system without anesthetic.

Blood samples for analyses of blood gas tensions (Po_2 and Pco_2), pH, lactic acid, and enzymes were collected from most fish immediately after being brought aboard and from fish that were held in the life-support systems. The latter fish were sampled at various time intervals for periods up to about 12 hours after being caught.

During the cruise it became evident that some fish were nearly acidotic when brought aboard and others became acidotic after being held for various periods of time in the life-support system. Also associated with the acidosis there was a marked decrease in arterial oxygen tension, and as acidosis heightened there was a sharp decrease in caudal fin movement and other external signs of body activity. Dr. Kravis attempted to treat the acidotic condition by administering sodium bicarbonate via intra-arterial injection. Very spectacular and successful results were noted almost immediately. For example, in the first fish that was treated, the arterial blood pH had dropped to 6.9 from about 7.5, the Po_2 had dropped to about 10 from about 100 mm Hg, and caudal fin movement slowed to a near stop. One minute after administering 2.5 ml of sodium bicarbonate the pH of the arterial blood increased to 7.2 and the Po_2 to about 40 mm Hg, and the caudal fin movement increased. After 5 minutes, the pH increased to 7.5, the Po_2 increased to over 100 mm Hg and the caudal fin movement increased to about 100 beats per minute. Several more fish were successfully treated for acidosis by administering sodium bicarbonate.

Analysis of the data collected on the cruise is continuing and will be reported on later.

Joint NMFS-American Fishermen's Research Foundation Albacore Research Operations Continue

In addition to the early season studies carried on in offshore waters during June, cooperative NMFS-AFRF albacore scouting and research activities are being conducted in nearshore waters during the 1976 U.S. albacore fishing season. According to Dr. Michael Laurs, Leader of the Albacore Fisheries program at the La Jolla Laboratory, the objectives of the cooperative study are to locate commercial concentrations of fish for the fishing fleet; conduct tagging operations for the studies of the migration and growth of albacore; and to make oceanographic observations for evaluation of the influence of oceanographic conditions on variations in the availability of albacore. Three commercial albacore jigboats were chartered by AFRF to conduct the scouting and research operations. The chartered vessels, which also have NMFS technicians aboard, began operations in July.

* * * * * * * * * * *

Daily broadcasts of albacore fishing information over marine bands were begun on July 12. The broadcasts are being transmitted twice daily on weekdays and once on Saturday mornings. The broadcasts which are compiled by Robert Nishimoto, Fishery Biologist at the La Jolla Laboratory, include the latest albacore fishing information obtained from research vessels, cooperating fishing vessels, unloading station operations, and other sources. Highlights include location of active centers of fishing, typical fishing scores, size of fish, and ocean temperature conditions. A weather and sea state summary prepared by the National Weather Service is also given. Nearly coastwide reception of the albacore fishery advisory broadcasts is available again this year as broadcasts are being made by five radio stations between San Diego and Astoria, Oregon.

STOCK AND RECRUITMENT PROGRAM

Rearing Experiments to Evaluate Morphometric Measurements for Estimation of Extent of Starvation in Field-Caught Anchovy Larvae

Dr. John Hunter, Fishery Biologist, reported this month that larval rearing experiments were begun to evaluate morphometric measurements for the estimation of the extent of starvation in field-caught anchovy larvae. These same experiments are also used in the study of the use of otoliths for aging larval fishes because specimens with different feeding histories are needed to determine how food availability affects the formation and spacing of daily growth increments on the otolith. For a preliminary experiment, a group of anchovy larvae were starved and fed alternately three times over a period of 50 days. Preliminary analysis of the morphometric data indicated that body depth decreased during periods of starvation or low food ration and returned

to normal within a few days after feeding was resumed. This morphometric measurement appeared to be quite sensitive to changes in food ration in laboratory grown larvae. Larvae captured in the sea of 6 to 15 mm standard length had a body depth comparable to that of fed and starved laboratory specimens. On the other hand, field-caught larvae larger than 15 mm had a body depth much less than that of starved laboratory specimens. This suggests that morphological changes occur in older laboratory reared specimens which makes them useless for the development of criteria for evaluating differences in body depth in field-caught larvae.

* * * * * * * * * *

Dr. Hunter also reported he has completed a draft of a manuscript on culture and growth of the Pacific mackerel (Scomber japonicus) which is currently being reviewed in the laboratory.

Analysis of Data on Larval Fish Food Organisms in New York Bight in Progress

During July, Dr. Edward Scura, Ms. Kathleen Dorsey, Ms. Marcia Pollack and Mr. Geoffrey Lewis, all of the La Jolla Laboratory, have been analyzing samples and data collected in the New York Bight during a cruise aboard the R/V Onrust from June 21 to 25. The objective of the cruise was to establish feeding criteria for first feeding larval scup, Stenotomus chrysops, and to describe the spatial and temporal distribution of larval food organisms in the nearshore region of the New York Bight. The search for larval food organisms was made using a system consisting of a plankton pump and an in-situ particle counter. Profiles were taken of the particle distribution in the water column and samples collected. Feeding experiments were conducted on the sea water samples using first feeding scup larvae. The larvae were collected and preserved after each feeding experiment for stomach content analyses which are currently being conducted. Aliquots of the sea water samples were also preserved for microscopic examination; this work is also ongoing. Plankton counts obtained from microscopic examination are being compared with the values obtained from the particle counter to evaluate the effectiveness of the instrument as a searching tool for larval food organisms.

Information gained from this cruise should help to identify some of the more important factors associated with larval feeding such as particle size preference, prey selectivity and the food threshold concentrations necessary to initiate feeding. Also, the caloric intake of the larvae during the experimental period is being calculated and compared with the caloric requirements of scup larvae, as deduced from laboratory experiments. This information should help in assessing the suitability of the different near-shore regions as larval feeding grounds since the spatial and temporal distribution of the food organisms can be evaluated relative to the results of the feeding experiments.

Laboratory-Reared Jack Mackerel Larvae Studied to Assess Effects of Starvation

Ms. Gail Theilacker, Fishery Biologist at the La Jolla Laboratory, continued to study the effect of starvation on laboratory-reared jack mackerel larvae. Ultimately, starvation in the sea will be assessed as a cause of larval mortality by examining net-caught larvae. Ms. Theilacker has demonstrated that starvation can be detected in laboratory-reared larvae which were deprived of food for one or more days by observing alterations in the microstructure of internal tissues. The use of a histological technique, however, for routinely monitoring sea-caught larvae (as a tool to estimate larval survival), would be extremely time-consuming. An alternate method for detecting starvation is now being tested.

During July, jack mackerel larvae were reared in two container sizes under various feeding and starving conditions and morphometric measurements were made daily. With the help of Mr. J. Caruso, Mathematicial Technician, efforts have been concentrated this month in preparing the morphometric variables for computer analysis to determine whether starvation is evident from differing body proportions.

The growth rate has been determined for the fed and starved groups in both container sizes (10 and 100 liters). The larvae grew faster and also starved faster in the large container. The differences in lengths were significant. There was also a significant difference in length between fed and starved larvae within each container treatment from Day 7 on (feeding begins on Day 6).

All of the 285 larvae measured were processed this month by Ms. Theilacker and Mr. Jack Metoyer, Biological Technician, i.e., embedded in paraffin, sectioned and stained for subsequent examination to determine the histological condition of each larva. The condition, whether the larva is graded as "healthy", "intermediate" or "starving", will be compared to the analysis of its body form.

Anchovy Larvae Examined for Histological Indications of Starvation

Dr. C. O'Connell, Fishery Biologist, reports that anchovy larvae specially collected in March have been studied and are now being examined for histological indications of starvation. Histological changes that occur during starvation have recently been determined for larvae reared in the laboratory. Less than 25% of the collected larvae, ranging from 4 to 10 mm in standard length, have been examined. So far, only one specimen shows tissue degeneration indicative of imminent death. This specimen comes from the tow that yielded the least number of anchovy larvae. Two other larvae, from a tow that contained many specimens, showed signs of moderate emaciation in the musculature, pancreas, and liver.

Aside from the low incidence of larvae in less than robust health, which cannot be evaluated until all specimens are examined, the material shows some consistent differences from the larvae reared in the laboratory. Certain tissue features, such as the trunk musculature and its supporting matrix, and also the hindgut mucosa, where intracellular digestion of protein takes place, display a degree of integrity and robustness not seen in laboratory specimens. Conversely, the sea-caught specimens show certain deficiencies, such as generally poorer condition of nuclei, tissue elisions in the pancreas, and poor condition of erythrocythes. These may be aspects of agonal changes induced by the trauma of net tow capture.

* * * * * * * * * *

Dr. A. Alvariño, Fishery Biologist, continued her examination of CalCOFI plankton collections for the presence and abundance of potentially important invertebrate predators of marine fish larvae. She reports that the data for 1956 (324 stations) for all predator groups (Chaetognatha, Siphonophorae, Medusae and Ctenophora) are now on punched cards, as well as that for the Chaetognatha for the years 1958 and 1954. She is currently working on the other groups for 1954 and 1956.

ECOLOGY OF THE CALIFORNIA CURRENT

CalCOFI Time Series Atlas Being Assembled

An atlas of time-series computer plots of temperature, salinity, oxygen, and sigma-t for 23 CalCOFI stations, selected along lines 60, 80, 90, 100 and 120, is being assembled by L. Eber, Oceanographer, and J. Metoyer, Biological Technician, at La Jolla. The plots portray contoured representation of the parameter values and their anomalies with respect to monthly means, from the surface to a depth of 200 m. Most of the computer runs required to produce the plots were carried out in June, following completion of the packed, binary file of CalCOFI oceanographic data at standard depths. Current efforts are devoted to filling-in data from stations not represented by the contours because they were isolated (in time) by more than 3 months, and to other activities prerequisite to finishing the charts.

Retrieval and Display System For CalCOFI Data Completed

A new system for storage, retrieval, and display of CalCOFI oceanographic station data has been completed by L. Eber and Nancy Wiley. The primary components are a set of files of the basic data both in card-image, EBCDIC format and in packed, binary, format, and a software package for maintaining the data files and selective extraction of the data for presentation in standard tabular and graphical formats.

One of the principal subfiles, containing data at standard depths only in the packed format, is being used for the preparation of an atlas of time-series charts of CalCOFI data taken in the upper 200 m. The standard depths file is also being used to create a regional subfile, in which the data will be pooled by regions defined for analysis of sized larval data.

A report describing the CalCOFI data system has been completed.

* * * * * * * * * *

Mr. James Zweifel Mathematician at the La Jolla Laboratory, has been investigating the estimation of stock biomass from fish eggs and larvae in an attempt to provide formal confidence limits for survey estimates. The approach has been to assume that each collection represents a unique situation and to assign to each collection an "effective weight" relative to a standard sample. The parameter estimates (means and variances) then apply to the standard condition and may be used directly for mortality and biomass estimation. Important components of the "effective weight" are a) time of spawning, b) rate of growth, c) retention and avoidance, and d) volume of water strained.

Parameter estimates (mean, contagion coefficient k) have been obtained from the CalCOFI survey data by year, quarter and region for larval anchovy in each of the eight size classes from 2.5 to 9.75 mm and mortality estimates have been calculated for the 2.50 to 5.75 and 6.75 to 9.75 mm intervals.

Numerous computer programs have been developed for analyzing each component of the "effective weight" as well as for estimation of the final parameter values. A draft document containing the theoretical development and sample analyses is nearly complete.

Efficiency of Sonar Mapping Studied

Mr. Paul Fiedler, second-year graduate student in Biological Oceanography at the Scripps Institution of Oceanography, is working at the La Jolla Laboratory under a Marine Research Committee contract to study the efficiency of sonar mapping with Fishery Biologist Paul Smith. In July, Mr. Fiedler created a computer program to simulate spatial arrangements of a segment of the northern anchovy population and to sample the population. Basic data used to create the spatial arrangement are derived from field measurements from California Department of Fish and Game and La Jolla Laboratory sonar mapping surveys. Individuals of the northern anchovy population are grouped into schools and the schools themselves are apparently aggregated into shoal groups. This latter property and the density of schools per nautical square mile are used to test the efficiency of sonar or other transects when transects are spaced various distances, from 2 to 25 miles. The cost of each spacing is then compared to the precision obtained from the test samples.

Long-Range Prediction of Spawning Biomass of Some Fish Populations Can be Inferred from Scale Deposition Rates

Dr. Paul Smith, Fishery Biologist, has completed an analysis of some populations of fish common to the temperate coast of North America, as inferred from Soutar and Isaacs scale deposition rates, which permits long-range prediction of the spawning biomass of these epipelagic fishes and Pacific hake. The equation derived for the total spawning biomass of Pacific sardine, northern anchovy, Pacific mackerel, Pacific saury, and Pacific hake is:

$$B_p = B_m \; x/+ \; \exp \langle 2S \rangle$$

where "B_p" is the average spawning biomass predicted for the next 5 year period, "B_m" is the average spawning biomass measured for the immediately preceding 5 year period and "S" is the sample standard deviation of the natural log of the ratio of spawning biomasses in 5 year segments "i" and the 5 year segment "i+1". This prediction is permitted because no significant runs are apparent in the sign of the population change and the magnitudes of the natural log of the ratios are normally distributed. For these species in the order of increasing variability the factor to be multipled or divided by is:

Total biomass	1.8
Epipelagic total	2.2
Northern anchovy	2.3
Pacific hake	2.9
Pacific sardine	4.2
Pacific mackerel	4.5
Pacific saury	12.4

Since rational management schemes have not been applied over the study period and significant fishing effort has been applied on only three of these species for any significant period of time, it is not know to what degree these activities may modify the predictions.

Recalculation of Sardine Populations Estimates Made

Mr. Alec MacCall, California Department of Fish and Game Biologist at the La Jolla Laboratory, has re-examined and updated sardine population estimates originally made by Dr. Garth Murphy when he was Coordinator of CalCOFI. These have been part of the basis on which anchovy spawning biomass has been estimated from egg and larva surveys. Since Murphy's time series can now be extended several years, and some of Murphy's assumptions could bear review, a recalculation of the sardine population estimates was undertaken.

The new time series extends from 1950 to 1965 and incorporates the following changes: 1) Age of full recruitment is 4 years rather than 3, as the latter are not fully recruited in many seasons. Murphy's assumption resulted in underestimated fishing mortality and overestimated population size. 2) The natural mortality rate was kept at 0.4 rather than doubled to 0.8 as Murphy did, as the new results were reasonably consistent with the larva counts without this questionable manipulation. 3) Only sardines presumed to have been caught north of Punta Baja were used in the analysis, since the area under consideration is that of the anchovy central stock which is being indirectly measured using sardine abundance. Also inclusion of the large Cedros Island catch in the later years causes population estimates to be high due to an increasing percentage of the total catch coming from the relatively lightly exploited southern group of fish, which may not have been fully available to the California fishery in any case.

The new analysis gives population sizes which are one-third those estimated by Murphy for the later years, and accordingly fishing mortality rates are triple those previously given. From 1954 on, the instantaneous fishing mortality rate averaged 2.5 times the natural mortality rate, with an average annual exploitation rate of 50% (reaching 80% in 1958). It appears unlikely that the stock could have withstood such fishing pressure no matter how good the relative recruitment. This points out the danger of allowing unrestricted fishing by fleets employing modern fishing technology and emphasizes the necessity of management which controls the exploitation rate in accordance with the ability of the stock to produce and sustain harvests.

Preliminary application of these new sardine biomass estimates to anchovy central stock biomass estimates show that estimated anchovy abundance may increase slightly, the change in sardine abundance being offset by a larger change in sardine larva counts in the area north of Punta Baja relative to the larger area previously used.

Work Continues on Identification Fish Eggs and Larvae

Work continued on identification of fish eggs and larvae in the CalCOFI collections, and on curating the extensive egg and larvae collections at the La Jolla Laboratory (several part-time summer workers were employed for this task). One of the technicians identifying CalCOFI survey collections of fish eggs and larvae, Sue D'Vincent, has ended her limited appointment. Until this position is re-established, the routine identification of larval specimens in the CalCOFI collections will be slowed down, according to Dr. E. Ahlstrom, Leader of the Marine Environmental Assessment program at the La Jolla Laboratory.

Dr. Ahlstrom further reports that illustrations of flatfish larvae of Hypsopsetta guttulata are being prepared by Biological Technician Barbara Sumida. These are quite similar to larvae Pleuronichthys ritteri, but with enough differences in distribution of pigment both on the body and in the finfolds to make definite identification possible for most specimens. Larvae of the four species of Pleuronichthys and of Hypsopsetta are the heavily pigmented pleuronectid flatfish larvae in the CalCOFI region. These are the species that are being dealt with by Ms. Sumida and is one phase of a larger project on flatfish life history series that is in progress by Dr. E. Ahlstrom, Dr. G. Moser, and Ms. B. Sumida.

Over the years, Drs. Ahlstrom and Moser have found the caudal fin and its supporting bones to be exceptionally useful in identification of fish larvae to order and family and sometimes even to genus or species. They are gathering this information together for a manuscript covering fish in eight orders. For each group, Drs. Ahlstrom and Moser will follow the development of the caudal complex in one or several species to emphasize those features which are conservative (stable) and those which are variable (labile). It is the combination of conservative and labile characters that make this fin such an important aid in identification of fish larvae and juveniles.

CalCOFI Hosts Otolith Workshop at Center

Fishery experts believe that one of the most promising fields in fishery research today is that of ageing fish on an absolute basis using daily rings formed on the otoliths (ear bones). For this reason an Otolith Workshop was convened by Drs. Edward Brothers of Cornell and Christopher Mathews of UNESCO and conducted at the Scripps Institution of Oceanography and the Southwest Fisheries Center July 12-16. There were 21 participants.

Eight papers were presented covering a variety of problems related to incremental growth in the otoliths of larval and adult marine and fresh water fishes, the statocysts of invertebrates and biological growth in relation to geophysics. The participants took part in demonstrations and laboratory work which included dissection of otolith from larval fishes and reading of such otoliths for daily, monthly, seasonal and annual growth increments, the preparation of acetate replicas of etched adult tuna otoliths and the reading of their daily growth increments; reading of growth increments in the statocysts of the squid. Loligo opalescens; and slicing adult hake otoliths with diamond cutting wheels and preparing acetate replicas of them for readings. A session was held at Scripps Institution of Oceanography where the scanning electron microscope was used to examine and photograph a number of the otoliths discussed during the workshop. The participants also examined specimen otoliths and exchanged information on the interpretation of readings during dual examinations of such specimens.

The workshop ended with a round-table discussion chaired by Dr. Paul Struhsaker which included an attempt to define and standardize the nomenclature of the parts of larval otoliths, a philosophical discussion of incremental growth in vertebrates and invertebrates, and plans for the publication of the proceedings of the workshop. Dr. Lasker was the conference coordinator.

Participants in the Otolith Workshop held at the Southwest Fisheries Center, July 12-16, from left to right are: 1) Mr. Kenneth Plummer, Scripps Institution of Oceanography; 2) Mr. James Uchiyama, Honolulu Laboratory; 3) Dr. Gary Sakagawa, La Jolla Laboratory; 4) Mr. John LaLanne, Northwest Fisheries Center, Seattle; 5) Professor S. Runcorn, University of Newcastle-On-Tyne, England; 6) Dr. Christopher Mathews, Ensenada, Mexico; 7) Mr. J. Spratt, California Department of Fish and Game, Monterey; 8) Dr. Ed Brothers, Cornell University, Ithaca, N.Y.; 9) Mr. David Kramer, La Jolla Laboratory; 10) Dr. S. Fagade, University of Ibadan, Nigeria; 11) Dr. John Hunter, La Jolla Laboratory; 12) Mr. Sherwood Maynard, Department of Oceanography, University of Hawaii; 13) Mr. Richard Methot, Jr., Scripps Institution of Oceanography; 14) Dr. Paul Struhsaker, Honolulu Laboratory; 15) Mr. John Butler, La Jolla Laboratory; 16) Mr. Paul Gregory, California Department of Fish and Game, Long Beach; 17) Mr. Alex Wild, IATTC. Attending the workshop but not shown in the photograph are: Dr. Geoffrey Moser, La Jolla Laboratory; Dr. Pereti Basasibwaki, Uganda; Dr. David Arthur, NOAA Post-Doctoral Fellow, La Jolla Laboratory; and Dr. J.C. LeGuen, OSTROM, New Caledonia.

NA RESOURCES PROGRAM

Study Underway on Fishing Effort Estimator for Tuna Purse Seining

The evaluation of fishing effort for purse seiners has not received much attention in the past. Often days fishing, estimated from logbooks or days absent from port are used as the effort estimator. Sometimes analysts adjust the effort measure to the average catch rate of a particular class, or size of vessel, and a large vessel is often credited with proportionally more effort than a smaller vessel. Such methods of evaluation are crude because they ignore the fishing process.

Since fishery biologists measure abundance of stocks by examining catch per unit effort, an effort estimator with large variance may lead to wrong conclusions about stock abundance. Mr. Paul Greenblatt, a graduate student at the Scripps Institution of Oceanography, working under the direction of Dr. Gary Sakagawa, Leader of the Tuna Resources program at the La Jolla Laboratory, has been formulating qualitative and quantitative models of an effort estimator for tuna purse seine fishing by taking account of the fishing process. The basic qualitative model developed by Mr. Greenblatt divides fishing activity of tuna purse seiners into two modes, searching and setting. By measuring the actual area searched by a vessel, and adjusting to the setting capability of the vessel, fishing effort is estimated more realistically. The ultimate goal of this study is to determine the most efficient effort estimator and apply the estimator to determine stock abundance.

Data from the 1975 porpoise observer cruises are being used in this study. Preliminary results indicate that about 62.4% of the variance in tuna catch can be accounted for by using an effort estimator, which is adjusted for searching and setting capabilities of the boats. In contrast, only 13.9% of the variance can be accounted for by using days at sea as the effort estimator.

Further analyses are underway to investigate how differences in visual-searching range of the boats, cooperation between vessels, and the multiple-species nature of the fishery influence fishing effort and success.

Extensive Warming of Sea Surface Temperatures Noted in the Eastern Tropical Pacific

Scientists from the Inter-American Tropical Tuna Commission (IATTC) and the National Marine Fisheries Service Laboratory (NMFS) at La Jolla, California, have cooperatively monitored ocean and atmospheric conditions over the fishing grounds in the eastern tropical Pacific for the past several years. Month-to-month sea surface temperatures (SST) and their deviations from long-term means have been published in the monthly Fishing Information, issued for the past 16 years by the La Jolla Laboratory.

Writing in the May 1976 issue of Fishing Information, Mr. Forrest Miller of IATTC noted a rapid warming trend in the SST along both sides of the equator and east of 110° W. The warming began earlier in 1976 along the coast of Ecuador north of Guayaquil (3° S) and appeared to be a repeat of events which occurred in April and May of 1975. However, by June and July 1975, the warming decreased and SST's off the coast of South America returned to normal. In contrast, during June 1976 the warming accelerated and expanded in area to such an extent that the SST patterns and anomalies resembled those in June 1972 when the last big El Niño began a rapid expansion. Although data from ships were sparse along the equator and coastal areas of South America, sea surface temperatures, based on satellite thermal infrared data, revealed extensive warming.

Mr. Miller believes that it is premature to state that an El Niño has begun since there is no official SST data from coastal stations in Ecuador and Peru. The surface meteorological charts from the National Weather Service and visual satellite composite photos from NOAA's National Environmental Satellite Service facsimile transmission have been showing above normal rainfall and clearer skies than normal since March 1976. Reports reaching the IATTC since April have noted that tuna fishing success diminished rapidly after SST's along the coast of Ecuador rose to above normal, beginning in March.

Dr. Clark and Mr. Miller believe that, considering the extensive warming that has taken place in the surface layers of the equatorial Pacific, and the continuing displacement of pressure systems in the eastern south Pacific, it is quite likely that above-normal SST's will persist until at least October. After a brief return to normal in October and/or November (statistically this always occurs), it is quite possible that SST's will again go well above normal along the coastal areas of South America from December 1976 to February 1977. As this year progresses, meteorologists now expect a westward and poleward expansion of above normal SST's, especially west of 120° W. The process has apparently progressed to the point where it is too late now for a rapid return to normal of sea surface temperatures.

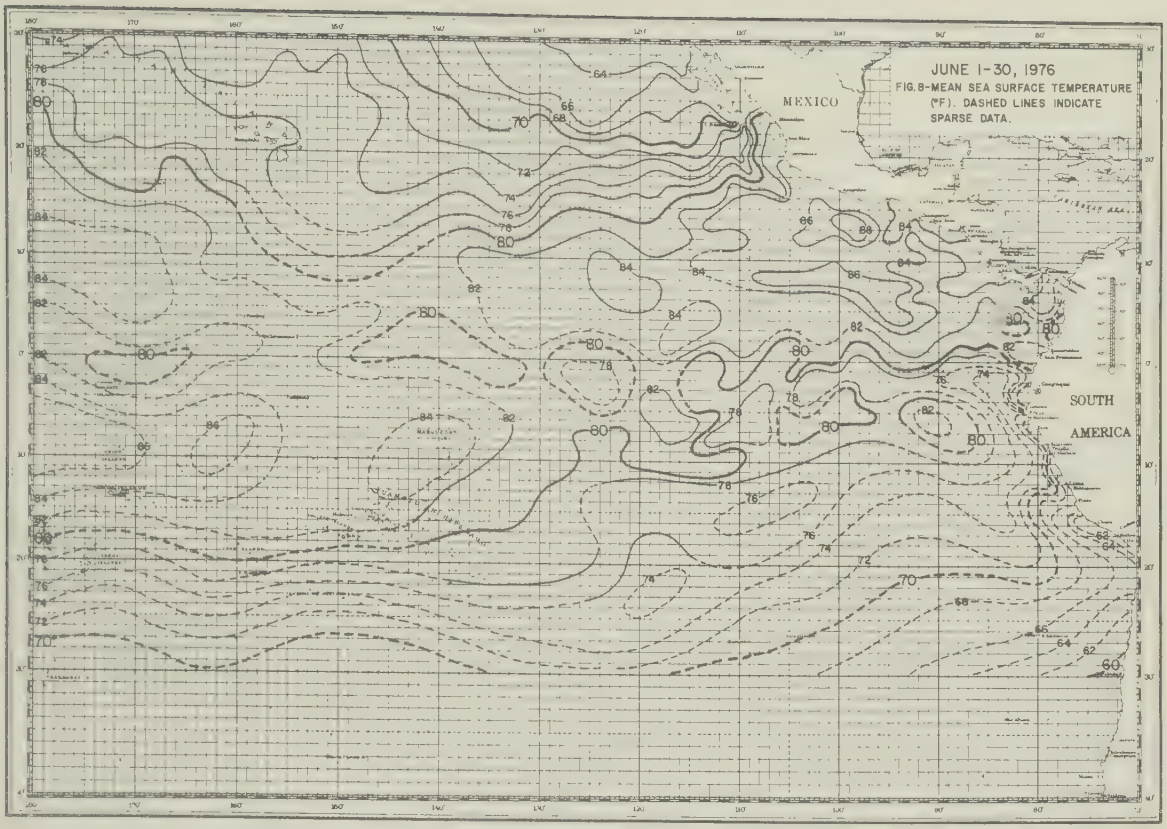


Chart above shows departures of the sea surface temperatures in June 1976 from the 20-year normals (1948-67) in the eastern tropical Pacific. The cross hatching along the coast of South America and on either side of the equator indices where temperatures were more than 2° F (1.1° C) above normal. Sea surface temperatures were below normal in June 1976 in stippled areas.

June Issue of Fishing Information Published

The June issue of Fishing Information was prepared and published during the month, according to Fishery Biologist James Renner of the La Jolla Laboratory who is the editor. Fishing Information is a monthly publication of the La Jolla Laboratory that regularly contains environmental charts for the north Pacific Ocean. The publication is distributed to a wide range of users both in the United States and foreign countries but is primarily intended for U.S. commercial and recreational fishermen along the west coast of the U.S. The first issue of Fishery Information was published in January 1960.

Tuna Vessels Participate in Fisheries Service FAX Program

During July, a total of 24 U.S. tropical tuna vessels participated in the FAX program of the La Jolla Laboratory.

July Reporting Rates

	Weather observations	XBT observations	Total	Total year to date
1975	342	44	386	2,347
1976	189	23	202	1,766
Percent change	-45%	-48%	-45%	-25%

Reporting rates for July were down from July of 1975 by 45% as shown above. The decrease in reporting rates for July results from the fact that many of the vessels are in port preparing for a trip outside the Commission Yellowfin Regulatory Area (CYRA).

The tuna seiner, Santa Rosa, led all cooperating vessels in July for the fourth consecutive month, with 27 weather observations sent to the Southwest Fisheries Center via radio station WWD. The Santa Rosa's reports comprised 12.7% of the total number sent in; congratulations are again due to Captains Noah and John Gomes of the Santa Rosa.

Atlantic Albacore Data Coded

As part of the ongoing research on tuna stock assessment and evaluation, the staff of the Tuna Resources program at the La Jolla Laboratory is creating a data management system for tuna fisheries data. Thus far, data bases for yellowfin, skipjack and bigeye tunas of the Atlantic have been created. Data on Atlantic albacore are currently being coded and edited for inclusion in the data system by Mathematician A. Coan and Mathematics Technician E. Ciarniello of the La Jolla Laboratory.

RPOISE/TUNA PROGRAM

Porpoise Stock Assessment Workshop Held at SWFC

In response to the decision by Judge Charles Richey and the stay subsequently granted by the U.S. District Court of Appeals in Washington, D.C., a workshop of recognized experts in the field of population dynamics and ecology was convened on July 27 at the Southwest Fisheries Center under the chairmanship of Dr. William Fox, Leader of the Oceanic Fisheries Resources Division.

According to Dr. Fox the workshop had five objectives: 1) develop a working definition of optimum sustainable population (OSP) of porpoises associated with the yellowfin tuna fishery in the eastern tropical Pacific; 2) estimate existing population levels of the 12 species of marine mammals involved in this fishery; 3) estimate OSP levels of the 12 species; 4) determine the impact of various levels of incidental mortality on the existing population levels and the OSP levels; and 5) prepare a report for the Director, SWFC, on the results of the workshop.

Participating in the workshop were the following: Dr. John Gulland, FAO, Rome; Dr. Douglas Chapman, University of Washington; Dr. Christopher Mathews, UNESCO, Paris; Mr. Patrick Tomlinson, Inter-American Tropical Tuna Commission; Dr. William Aron, Director of the Office of Ecology and Environmental Conservation, NOAA; Dr. Lee Talbot, President's Council on Environmental Quality; Dr. Bradford Brown, Northeast Fisheries Center, Dr. Brian Rothschild, Acting Director of the Extended Jurisdiction Planning Staff, and Drs. William Fox, William Perrin, Joseph Powers, and David Au of the Southwest Fisheries Center.

Mr. Robert Scott, NMFS, Washington, Mr. Skip Spensely, House Merchant Marine and Fisheries Subcommittee, and Mr. Ted Dinterman, a Congressional Aid, attended the workshop as observers. Dr. Tim Smith of the University of Hawaii, formerly of the SWFC, who is a newly-appointed member of the Scientific Committee to the U.S. Marine Mammal Commission, also observed the first day of the workshop.

Most of the participants and observers departed on Friday, July 30. A draft report of the results of the meeting will be circulated among the participants in early August for their concurrence.

Cooperative Experimental Gear Tests in Progress

Mr. John Everett, Porpoise Program Manager, reports that of the 10 Bold Contender system tests, there have thus far been seven complete trips and two incomplete (trips prematurely terminated in response to initial court decision on fishing by setting on porpoise) trips.

Five vessels carrying the fine-mesh Medina panel system are at sea. As of this writing one trip has been completed, and four trips were incomplete. An 11th vessel is being outfitted with these gear to test the system.

Estimate of Incidental Kill of Porpoise for the U.S. Fleet Prepared

The staff of the Porpoise/Tuna program has completed an estimate of the incidental kill of porpoise for the U.S. fleet only, as of July 30, 1976. If the present rate continues, the estimated projection to the end of the year is 71,000 animals, compared to the estimated kill for 1975 of 134,000.

TIBURON LABORATORY

COASTAL FISH COMMUNITIES INVESTIGATIONS

Study Relating Submarine Light to Visual Pigments and Activity of Kelp Forest Fishes Nears Completion

During this month, Dr. Edmund Hobson, Investigation Leader at the Tiburon Laboratory, joined with Dr. William McFarland, Cornell University, to complete the field work of their study relating the characteristics of submarine light to the visual pigments and activity of fishes in southern California kelp forests. This study is an extension of earlier work by Dr. McFarland on light and visual pigments and tropical marine fishes that was strongly influenced by Dr. Hobson's studies of the activities of those species.

Design of Coastwide Rockfish Survey Discussed

Dr. William Lenarz, Task Leader of the Rockfish Analysis Task, and Fishery Biologist Peter Adams, met with Dr. David Kimura, Statistician, Washington State Department of Fisheries to discuss the design of the coastwide rockfish survey. A joint effort will be undertaken to develop a model of the survey, taking advantage of the circumstance that computer facilities at Tiburon are similar to those used by Mr. Kimura in Washington. Dr. Lenarz and Mr. Adams will estimate parameters for the model from data collected during the prototype survey in Monterey during August, while Mr. Kimura will do the same from data obtained during the prototype survey in Queen Charlotte Sound, as well as data from an Oregon groundfish survey.

* * * * * * * * * *

A manuscript entitled "A theoretical examination of some aspects of the interaction between longline and surface fisheries for tunas," co-authored by Lenarz, was sent to outside reviewers.

YSIOLOGY INVESTIGATIONS

Sources of Early Mortality--Data Resulting from Striped Bass Experiments to be Analyzed

Dr. Jeannette Struhsaker, Chief, Physiology Investigations, reported that several hundred striped bass larvae survived from two long-term rearing experiments testing the effects of various food types and densities and two different salinity regimes.

Both experiments were terminated when larvae were 29-30 days old. Data generated from these experiments are presently being analyzed to determine the food regime and food density resulting in best growth and survival. Initial results from testing larvae reared in fresh water as opposed to those brought to an isosmotic salinity clearly showed that survival was greater in the isosmotic treatment. Possible explanations for this result will be explored in future experiments.

A third experiment was begun with surviving larvae and newly metamorphosed juveniles from the first two experiments. The principle objective is to determine the predator-prey relationship of young striped bass and Neomysis shrimp, the latter having been demonstrated from CF&G field studies to be the major food of young striped bass in the Delta. Other ancillary experiments are being conducted on the digestive rates and growth and on the identification of pigments in striped bass ovarian eggs just prior to spawning.

Until the next striped bass spawning season, studies will center around the culture requirements of various zooplankton species eaten by striped bass larvae in the Delta, and the development of pigments in the maturing ovaries.

* * * * * * * * * *

Ms. Tina Echeverria, Fishery Biologist, is preparing a research proposal to meet the requirements of an MS degree at San Francisco State University. She is planning to study predation on striped bass larvae, including cannibalism and predation by cyclopoid copepods.

COASTAL FISHERIES INVESTIGATIONS

Reorganization of Experimental Design for OCSEAP Food Chain Study Begun

Mr. Thomas Yocom, Fishery Biologist, joined the staff of the OCSEAP project this month and together with Dr. Jeannette Struhsaker, Chief, Physiology Investigations, and Mr. Peter Benville, Chemist, began reorganization of the experimental design for the food chain studies. According to the U.S. Civil Service Commission, none of the technical staff to be hired for these studies (except for Mr. Yocom) could begin work prior to October 1, 1976. With these severe manpower limitations, the studies were re-designed and greatly simplified to enable them to be initiated by a minimal staff.

Plans were begun to renovate the existing wet lab to accommodate many more test tanks and to improve the quality of the water supply. The present system does not control temperature within the limits necessary for the oil studies.

Preparations for Jordan Cruise Continue

Mr. Sus Kato, Leader, Coastal Fisheries Investigations at the Tiburon Laboratory, reports that cruise plans and rosters have been finalized for the September 5 to 17 Jordan cruise. About 25 fishermen and processors will participate in the cruise, together with researchers from Sea Grant, CF&G, SIO, and other agencies and universities.

Samples of Euphausia Bringing Good Reactions from Buyers and Dealers

Samples of freeze-dried Euphausia sent to prospective buyers and dealers have brought good reaction regarding appearance and taste. Mr. Kato reports he is now awaiting determination of price, acceptable processing methods, and quantity needed to determine feasibility of starting a small fishery on this underutilized species at this time.

Inoculation of Silver Salmon Completed

Inoculation of silver salmon against vibriosis was completed as scheduled at the California Department of Fish and Game's Mad River hatchery near Arcata, California, for pen-rearing at the Tiburon Laboratory later this year. Work proceeded smoothly with a crew of 16 assembled from the Tiburon Laboratory, U.C. Sea Grant and their volunteers, and the San Francisco Tyee Club. Attending from Tiburon were Mr. Roger Green, Mr. Ed Gullekson, Mr. Lloyd Richards, and Ms. Susan Smith. A total of 69,067 fish were innoculated and an additional 3,421 were culled as over or under-sized and released into Mad River. When they reach a suitable size for salt water adaptation, approximately 25,000 of the innoculated fish will be used by Sea Grant for their Tomales Bay pen-rearing project, the rest going to the Tiburon Laboratory rearing pens.

Thirteen tags from previous releases of silver salmon were returned to Tiburon Laboratory during the month. One of these was from the March 1976 release, the rest from the October-November 1975 releases. The sizes of these recaptured salmon range from 432 to 610 mm total length. Sizes at release ranged from 125 to 272 mm fork length. All were ocean-caught, mostly within 100 km north and south of the Golden Gate.

* * * * * * * * * *

Page Layout of Anglers' Guide Completed

The page layout of the Anglers' Guide galleys was completed this month by NMFS' Scientific Publications Staff (SPS) in Seattle, and copies sent to authors Jim Squire at La Jolla, and Susan Smith at Tiburon. It appears that the book will be shorter than expected--only 146 pages long. Originally, the printer had estimated that it would run over 300 pages.

After the layout has been reviewed by the authors and some minor changes have been made, it will be returned to SPS for submission to the printer, who will use it as a guide in pasting up the camera-ready artwork and copy. The Anglers' Guide, due to be available for distribution by fall, describes marine game fish, fishing grounds, and angler facilities all along the U.S. West Coast from California to Alaska, and around the tropical islands of Hawaii, American Samoa, and Guam.

* * * * * * * * * *

Work Begun on Present Fishing Methods and Tackle

Work continues by Ms. Susan Smith on the chronology of changes in recreational fishing tackle and methods in California since the turn of the century. Most of the month was spent gathering information on present methods and tackle (1970-1976), and filling in gaps on past methods, including historical background on such fisheries as grunion gathering, smelt netting, and early striped bass fishing.

UBLIC RELATIONS - SOUTHWEST FISHERIES CENTER

July 8 - Mr. Jim Squire, Fishery Biologist, La Jolla Laboratory, discussed the recreational fisheries program of the Southwest Fisheries Center at a meeting of the Exchange Club of San Diego, California.

- Dr. William Fox, Leader of the Oceanic Fisheries Resources Division, was interviewed by Susan Pollock of public television station KPBS, San Diego, Channel 15, on government efforts to alleviate incidental porpoise mortality in the eastern tropical Pacific tuna fishery.

13 - Mr. W. Gookin, a teacher in the San Diego School system brought students attending a special summer class in Oceanography at Scripps Institution of Oceanography to the Center for a lecture on fisheries research at the La Jolla Laboratory and a tour of the facilities. Ms. L. Vlymen was the tour guide.

- This was the occasion for the first showing of a slide lecture on Center research assembled and written by Mr. Ken Raymond and narrated by Mr. Henry Orr. The Center has purchased equipment which is available to the staff wherein slides and the accompanying narration can be synchronized to produce a taped, illustrated lecture.

22 - Dr. William Fox, Chief of the Oceanic Fisheries Resources Division and Mr. Floyd Anders, Deputy Regional Director, Southwest Region, participated in a live, feedback segment of a 1-hour program on the "The Tuna and the Porpoise: Economics versus Extinction?", a production of the KPBS-TV (Channel 15) Science office in San Diego. Other panelists included Captain Julius Zolezzi, tuna boat owner and operator and Mr. Stan Minasian, the founder and president of "Save the Dolphins". During the earlier taped portion of the program, Dr. Fox and Dr. William Perrin were interviewed by Dr. Jeff Kirsch of KPBS on the status of the NMFS research program to alleviate porpoise mortality.

- Fishery Biologist Heeny Yuen and Biological Technician Ray Sumida left for Kailua-Kona, Hawaii for the annual Hawaiian International Billfish Tournament. Mr. Yuen and Mr. Sumida will be acting in the capacity of resource persons for the tournament to answer any questions on billfish biology that the tournament participants may have. They will also make biological observations on all fish caught during the tournament.

TRAINING

July 12 - Pete Benville of the Tiburon Laboratory attended a course in liquid chromatography sponsored by Hewlett-Packard in Santa Clara, California.

12 - 16 - Catherine J.C. Hurst, Administrative Clerk, CSC Training Course "Small Purchases."

13 - August 3 - Spanish Language Course La Jolla Laboratory, Messrs. Gary Stauffer, Larry Eber, Nathan Clark, John MacGregor. Geoff Moser.

20 - Administrative Officer Wally Giguere of the Tiburon Laboratory attended a seminar on the Federal Telecommunications Service sponsored by GSA.

MEETINGS AND TRAVEL

June 30 - Sus Kato, Tiburon Laboratory, traveled to Pt. Arena to discuss experimental fishing techniques for rockfish with Sea Grant Advisor Bruce Wyatt and a commercial fisherman. Plans were laid to conduct some experiments jointly with the fisherman.

July 6 - 10 - Dr. Reuben Lasker, Leader of the Coastal Fisheries Resources Division, La Jolla Laboratory, traveled to Washington, D.C. for a meeting of the National Science Foundation and then stopped off in Boulder, Colorado for an Ocean Sciences Board meeting of which he is a member.

8 - Mr. R. Shomura, Honolulu Laboratory, attended an informal bi-weekly "keeping current" meeting attended by Coast Guard, Fish and Game, Fish and Wildlife Service, Sea Grant and NMFS participants to exchange information on activities underway for extended jurisdiction covering the U.S. 200-mile fishing zone.

8 - 11 - Ms. Anita Coit, Administrative Assistant, La Jolla Laboratory, traveled to San Francisco to attend the Seventh Annual Conference of Federally Employed Women, Inc. Ms. Coit recently stepped down after a year as President of the San Diego Chapter of FEW.

9 - Mr. R. Shomura attended a meeting to discuss billfish management policy considerations in development of preliminary management plans for use in connection with extended jurisdiction. Mr. Frank Goto, United Fishing Agency; Mr. Peter Fithian, Hawaiian International Billfish Association; Henry Sakuda, State Fish and Game were in attendance.

11 - 16 - SWFC Executive Officer B. Remington traveled to Washington, D.C. to attend a Reorganization and Financial Management conference.

12 - Mr. Shomura attended a meeting to discuss precious coral management policy considerations--preliminary management plans, extended jurisdiction. Mr. Cliff Slater, Maui Divers; Dr. Rick Grigg, Sea Grant; Mr. Frank Goto, United Fishing Agency; Mr. Kenji Ego attended this meeting.

12 - 15 - Mr. R. Counts, Fishery Biologist, La Jolla Laboratory, was in Morro Bay and San Pedro, California for training in trawl construction and repair.

14 - Mr. Shomura met with Messrs. Palmer Sekora and Charles Renda of the Honolulu and Sacramento Fish and Wildlife Service offices, respectively, to further discuss cooperative proposal in the Northwestern Hawaiian Islands.

- Messrs. Shomura and Heeny Yuen met with Ms. Mere Kress, Director, the Pacific Championship (recreational fishing tournament) who wanted NMFS participation in the Championship program.

15 - Mr. Shomura attended a luncheon meeting with local tuna fishing industry representatives to discuss the arrival in Honolulu and subsequent allocation of the 1,300 scoops of anchovy bait to the aku fleet brought in by the Pacific Trojan from California.

15 - 16 - Dr. Struhsaker, Mr. Benville and Mr. Tom Yocom traveled to the National Marine Fisheries Service, Northwest Fisheries Center, Seattle, Washington, to discuss methods of dissolving soluble fractions of crude oil in water and techniques to measure the level of water-soluble oil fractions in water and in plant and animal tissues.

- Similar topics were discussed on July 21 at a meeting with researchers from the University of California at Berkeley (Richmond Field Station) attended by Dr. Struhsaker, Mr. Benville and Mr. Yocom. Plans were made to visit the Univer- sity Laboratory to observe their apparatus for solubilizing (fractions.

16 - Mr. Shomura had brief discussions on the Cromwell opera - tions with Admiral Allen L. Powell, NOAA, NOS, Rockville, Maryland, and on precious coral with Dr. Rick Grigg of Sea Grant.

21 - Mr. Shomura spent the day at sea aboard the Lehua to observe aku fishing using the imported anchovy as bait.

- Mr. Maxwell Eldridge, Tiburon Laboratory, visited Dr. Florence Harrison and Mr. David Rice at the Lawrence Livermore Laboratory, Livermore, California. The purpose of the visit was to discuss mutual problems of larval fish research and to see the test facilities of LLL's Marine Science Center.

21 - 24 - Mr. J. Everett, Porpoise Program Manager, attended the meeting of the U.S. Marine Mammal Commission and its committee of scientific advisors at the University of California, Santa Cruz. Among the topics discussed at the meeting was the determination of the optimum sustainable population levels for marine mammals, applications for taking animals for research and public display, the taking of porpoise by tuna fishermen, and applications from Alaska and California to manage certain marine mammals. The Commission was established by Congress in 1972 to oversee policies and actions concerned with the conservation of marine mammals and their environment.

22 - 23 - Dr. P. Smith assisted in the calibration of the Mexican research vessel, Alejandro de Humboldt, which will be conducting cooperative research surveys with NMFS.

26 - An Instituto Nacional de Pesca/CalCOFI Data Management Committee meeting was held at the Center. Mr. David Mackett, Program Planning Officer attended for the Center.

VISITORS

Honolulu Laboratory

July 19 - Peter Saul, Ministry of Agriculture and Fisheries, New Zealand, en route to the Billfish Tournament in Kailua-Kona.

20 -Stan Smith of the Tiburon Laboratory, who arrived aboard the Pacific Trojan.

La Jolla Laboratory

July 2 - Mr. Sidney Feldman, National Ocean Survey, Silver Springs, Maryland.

8 - Mr. Kunihiko Baba, Meteorologist and Oceanographer of Ocean Route Co., Ltd., Tokyo, Japan, visited the Center to confer with Dr. M. Laurs.

13 - Mr. Fred Marck, Aid, Senator John Tunney's office, San Diego, California.

16 - Mr. Geoff Arnold, Ministry of Agriculture, Fisheries and Food, Lowestoft, Suffolk, England.

17 - 18 - Mr. Herbert Stern, Jr., Northeast Fisheries Center, Woods Hole, Massachusetts.

19 - Dr. Man-Loong Chan, Tetra-Tech Corp., Lafayette, California, to confer on global tunas contract with Drs. Sakagawa, Huppert and Fox.

20 - Mr. Bruce McAlister, Northwest Fisheries Center, Marine Mammal Division, Seattle, Washington.

23 - Mr. Marlo Martin, Lawrence Radiation Laboratory, Berkeley, California.

28 - Dr. Philip Stiles, Arizona State University, Division of Agriculture, Tempe, Arizona.

Tiburon Laboratory

July 2 - Paul Meyers, Hewlett-Packard, Santa Ana, California.

7 - Bob Huffer, SIO, La Jolla, California.

9 - J. Kelley and M. Wells, San Francisco State University, San Francisco, California.

19 - Dan Kimura, Washington State Department of Fisheries, Olympia, Washington.

- K.E. Guziak, Union Oil Co. of California, Los Angeles, California.

ERSONNEL

			Laboratory
July	6	- Rita Joan Ziegler, Clerk-Typist, Career Conditional Appointment, Part-Time.	Tiburon
		- Victor A. Honda, Biological Aid, Career Conditional Appointment.	Honolulu
		- Dr. Nancy Lo, Biological Statistician.	La Jolla
		- Mr. Wayne Maxwell, Statistical Assistant (Temporary).	La Jolla
		- Ms. Julie Zykin, Summer Aid.	La Jolla
		- Mr. Michael Klicpera, Summer Aid.	La Jolla
		- Mr. Stephen Reilly, Biological Technician (Temporary).	La Jolla
	29	- Roy Mendelssohn, Operations Research Analyst, Career Conditional Appointment.	Honolulu
	31	- Edwin K.W. Lee, Administrative Officer, Retirement.	Honolulu

UNITED STATES
DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE
SOUTHWEST FISHERIES CENTER
8604 LA JOLLA SHORES DRIVE
P.O. BOX 271
LA JOLLA, CALIFORNIA 92038

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300
11ND-COM-2700/1 (REV. 6-75)

AN EQUAL OPPORTUNITY EMPLOYER

POSTAGE AND FEES PAID
DEPARTMENT OF COMMERCE
COM-210

THIRD CLASS